

Solving Fractional First Degree Equations

Solving Equations Involving Fractions

Here is an easy method for solving equations involving fractions

Remember that equations are like a scale – as long as you do the same thing to both sides it will remain balanced.

Step 1: Multiply both sides of the equation by the LCD (lowest common denominator)

Step 2: simplify each term and the fractions will disappear

Step 3: Solve as you would any other first degree equation

$$(20) \frac{x}{5} = \frac{3}{4} (20)$$

$$\frac{20x}{5} = \frac{60}{4}$$

$$4x = 15$$

$$\frac{4x}{4} = \frac{15}{4}$$

$$x = \frac{15}{4}$$

$$8\left(\frac{3}{8}y - \frac{1}{4}y = -2\right)$$

$$\frac{24}{8}y - \frac{8}{4}y = -16$$

$$3y - 2y = -16$$

$$y = -16$$

Cross-Multiplying

Cross multiplying is a shortcut for getting rid of the denominators

Cross multiplying is a method used to solve equations involving fractions when you have one fraction = to another fraction

This is the way you do it:

$$\text{if } \frac{a}{b} = \frac{c}{d} \text{ then } ad = bc$$

$$\frac{x}{5} = \frac{3}{4}$$

$$4x = 15$$

$$\frac{4x}{4} = \frac{15}{4}$$

$$x = \frac{15}{4}$$

We are now ready for more challenging examples.

Example

1. Solve the following equation:

$$t + \frac{t}{2} = \frac{t}{3} + \frac{t}{4} - \frac{11}{2}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$12\left(t + \frac{t}{2} = \frac{t}{3} + \frac{t}{4} - \frac{11}{2}\right)$$

$$12t + \cancel{\frac{12t}{2}}^6 = \cancel{\frac{12t}{3}}^4 + \cancel{\frac{12t}{4}}^3 - \cancel{\frac{132}{2}}^{66}$$

$$12t + 6t - 4t - 3t = -66$$

$$12t + 6t - 4t - 3t = -66$$

$$11t = -66$$

$$\frac{11t}{11} = \frac{-66}{11}$$

$$t = -6$$

2. Solve the following equation:

$$\frac{7z}{8} = \frac{-1}{2}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$8\left(\frac{7z}{8} = \frac{-1}{2}\right)$$

$$\cancel{\frac{7z}{8}}^7 = \cancel{\frac{-1}{2}}^4$$

$$7z = -4$$

$$\frac{7z}{7} = \frac{-4}{7}$$

$$z = \frac{-4}{7}$$

3. Solve the following equation:

$$\frac{2y - 6}{3} = \frac{2 + y}{4}$$

- Cross Multiply or multiply entire equation by LCD
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$4(2y - 6) = 3(2 + y)$$

$$8y - 24 = 6 + 3y$$

$$8y - 3y = 6 + 24$$

$$5y = 30$$

$$\frac{5y}{5} = \frac{30}{5}$$

$$y = 6$$

4. Solve the following equation:

$$\frac{6x + 3}{7} + \frac{3x - 5}{3} = 0$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$21\left(\frac{6x + 3}{7} + \frac{3x - 5}{3} = 0\right)$$

$$\cancel{3}\frac{\cancel{21}(6x + 3)}{\cancel{7}} + \cancel{7}\frac{\cancel{21}(3x - 5)}{\cancel{3}} = 0$$

$$3(6x + 3) + 7(3x - 5) = 0$$

$$18x + 9 + 21x - 35 = 0$$

$$18x + 21x = -9 + 35$$

$$39x = 26$$

$$\frac{39x}{39} = \frac{26}{39}$$

$$x = \frac{26}{39}$$

$$x = \frac{2}{3}$$

5. Solve the following equation:

$$\frac{3r-2}{4} - \frac{r+3}{8} + \frac{11}{16} = \frac{7r-1}{16}$$

- Multiply the entire equation by the LCD
- Simplify each term to get rid of fractions
- Expand each side
- Transpose terms to get all of the variables on the left and all of the numbers on the right
- Collect like terms
- Divide by the coefficient of the variable

$$16\left(\frac{3r-2}{4} - \frac{r+3}{8} + \frac{11}{16} = \frac{7r-1}{16}\right)$$

$$\cancel{4}\cancel{16}(3r-2) \cancel{\frac{16}{4}(r+3)} \cancel{\frac{16}{16}(11)} = \cancel{16}\cancel{(7r-1)}$$

$$4(3r-2) - 2(r+3) + 11 = 7r-1$$

$$12r - 8 - 2r - 6 + 11 = 7r - 1$$

$$12r - 2r - 7r = -1 + 8 + 6 - 11$$

$$3r = 2$$

$$\frac{3r}{3} = \frac{2}{3}$$

$$r = \frac{2}{3}$$